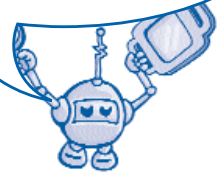


We all need to eat and drink to stay alive. However, if you don't take care when you buy, prepare and cook your food, it can make you ill.

At last, we've crash-landed on Planet Earth. I need a nutrient fix - let's get stuck into this human food.



Yes, but be cautious - even humans can get ill if they do not take care with their food. It's something called food poisoning.



They poison themselves? Sounds crazy to me, I thought food should keep you healthy!



task 1a Mini survey: Micro-organisms and food poisoning

Produce a small questionnaire on food poisoning to find out what people know about it. Find out how many people in your class have experienced food poisoning, or knows someone who has. Ask them to describe the symptoms and to name the foods which may have caused it. Record the results.

Information burst

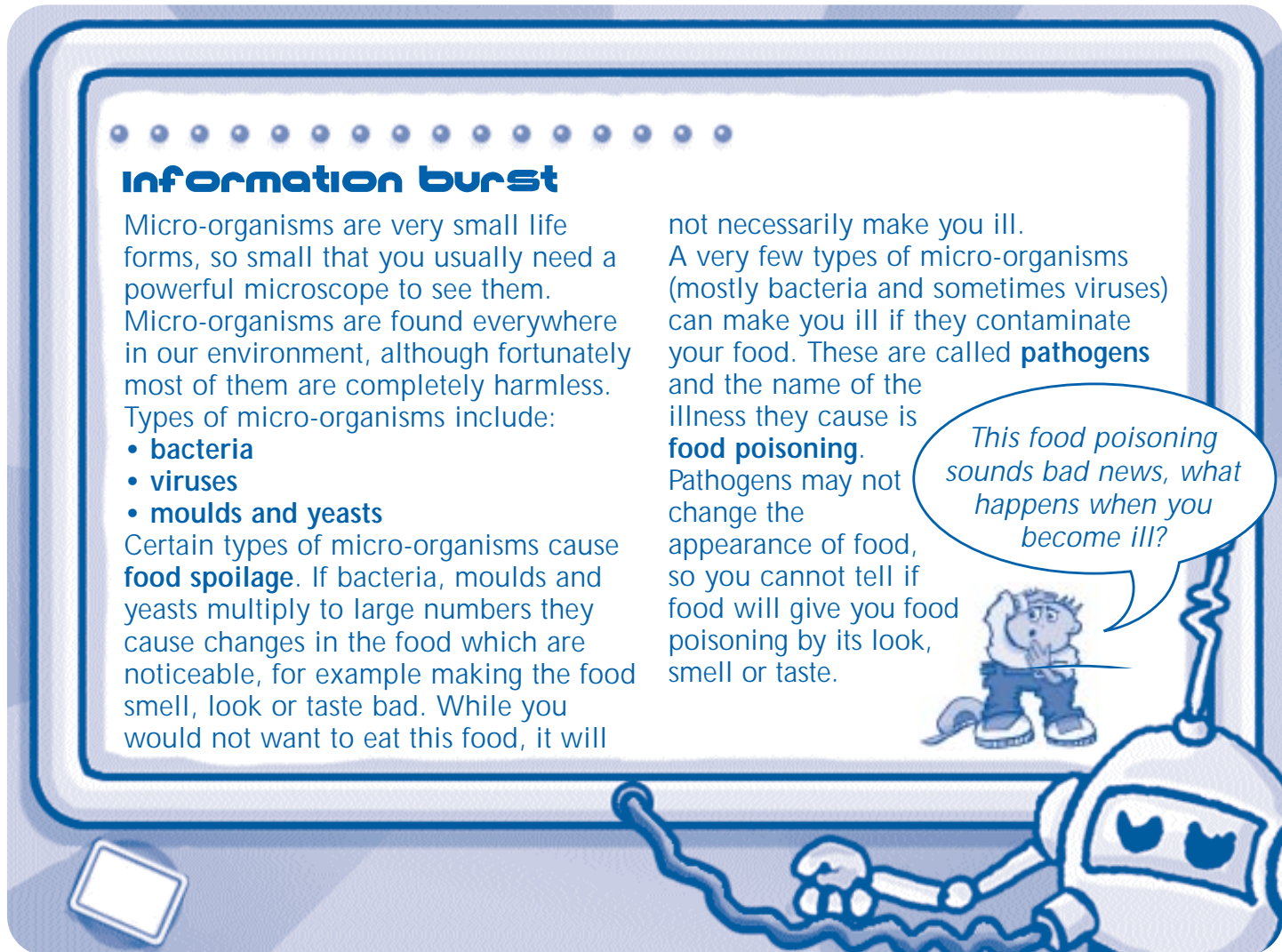
Micro-organisms are very small life forms, so small that you usually need a powerful microscope to see them. Micro-organisms are found everywhere in our environment, although fortunately most of them are completely harmless. Types of micro-organisms include:

- bacteria
- viruses
- moulds and yeasts

Certain types of micro-organisms cause **food spoilage**. If bacteria, moulds and yeasts multiply to large numbers they cause changes in the food which are noticeable, for example making the food smell, look or taste bad. While you would not want to eat this food, it will

not necessarily make you ill. A very few types of micro-organisms (mostly bacteria and sometimes viruses) can make you ill if they contaminate your food. These are called **pathogens** and the name of the illness they cause is **food poisoning**. Pathogens may not change the appearance of food, so you cannot tell if food will give you food poisoning by its look, smell or taste.

This food poisoning sounds bad news, what happens when you become ill?



The illness usually lasts 1-2 days. The most common symptoms are:

- stomach and gut pain
- feeling and being sick
- diarrhoea

So who can get this food poisoning then?



Anyone can be affected by food poisoning but some people are particularly at risk. The most vulnerable people are:

- babies & toddlers
- older people
- people who are already ill
- pregnant women

This is because they have less resistance to illness. For these people getting food poisoning can be very serious.

Well how common is this food poisoning then?



Food poisoning is very common. In 1998 there were almost 100,000 reported cases of food poisoning in the UK. The real number is thought to be much higher as not everyone who is ill goes to their doctor.

With most cases of food poisoning people recover in a few days. Sometimes the illness will be much more serious and it can kill people. In 1997 nearly 50 people died as a result of salmonella food poisoning.

This is much less than for some other everyday risks, such as crossing the road, but it does show that getting food poisoning can be very serious.

task 1b Design and make a leaflet

Design and make a leaflet on food poisoning.

You've got to tell me! What can we do to stop people getting it?!

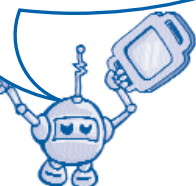


Food poisoning is completely preventable. It only happens when someone makes a mistake. Everyone involved in the manufacture, sale, transportation and purchase of food has a role to play in preventing food poisoning. There are rules you can apply when storing, preparing and cooking food which will ensure that the food on your fork is safe to eat. These are called the rules of food hygiene.

I don't follow rules. We know pathogens are the enemy, just tell me their names and I'll get them, they're only tiny!



I'd like to see you try! Remember you can't see them - we'll have to be a bit more clever than that to find them, stop them and kill them. We need a plan. First we have to know more about them.



information burst

Where do they come from?

Pathogen	Common Source
Salmonella	Raw poultry, eggs, raw meat, raw milk, human and animal faeces
Campylobacter	Raw poultry, raw meat, raw milk, human and animal faeces
Escherichia coli O157	Raw meat, raw milk, human and animal faeces
Staphylococcus aureus	Human body especially mouth, nose, and boils
Bacillus cereus	Rice
Viruses	Shellfish

Note: The first five are bacteria.

How do they make you ill?

Eating a pathogen - If a pathogen gets into your stomach and guts the bacteria can then multiply. This is how the most common pathogens in the U.K., Campylobacter and Salmonella, make you ill. For some pathogens you may need to eat many, many thousands to become ill, for others (such as Escherichia coli O157) you may only need to eat a few.

Eating a toxin - Some bacteria, such as Staphylococcus aureus and Bacillus cereus, produce a poison (called a toxin) when they multiply in foods. In these cases, it is eating this toxin that makes you ill, not eating the bacteria.

Bacterial multiplication

Bacteria multiply in a simple way called **binary fission**, where one bacterium simply divides into two. In order to multiply bacteria need **four** things:

- Food** Bacteria like foods that are rich in nutrients (high risk foods)
- Moisture** Bacteria need moisture in their food to be able to multiply
- Warmth** Bacteria can multiply at temperatures between 5°C and 63°C
- Time** Bacteria need time to multiply

If all these conditions are right, then the numbers of bacteria can double every 20 minutes. This means that in a few hours a few bacteria can increase to high enough numbers to make the food unsafe to eat.

Some bacteria, such as Bacillus cereus are able to form a spore. This is its armour and protects the bacteria enabling it to survive dry conditions and high temperatures. This means that if the conditions are right they can start to multiply on foods (and perhaps produce toxins) after cooking.

task 2a Search the media

Research data about food poisoning. Tabulate the information using the following headings:

Bacteria	Food source	Mistakes

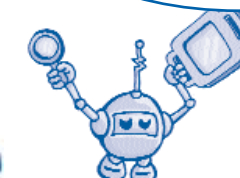
Fortunately there are things that you can do to stop your food giving you food poisoning:

1. Stop bacteria from getting onto food
2. Stop bacteria from multiplying in food
3. Kill bacteria

These pathogens might have very grand names but they shouldn't be hard to find!



Remember the plan! It's important if we are going to make safe food: remember steps 1, 2 and 3.



task 2b Chicken curry for supper

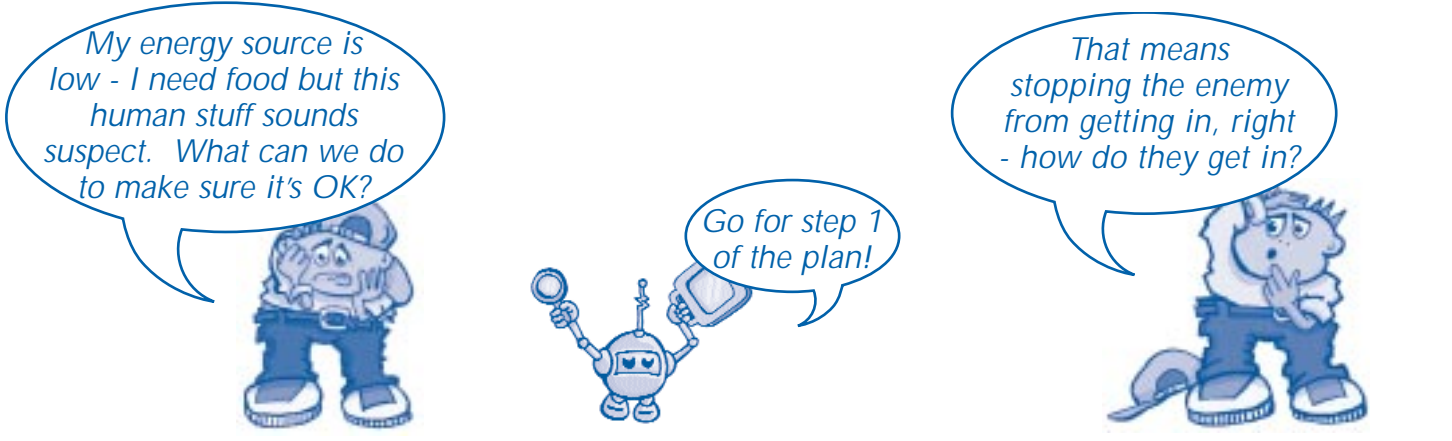
Consider and explore whether this dish is safe and the reasons why, knowing that during preparation, your brother admitted to the following mistakes:

- sneezing over the food
- seeing flies on it
- not washing his hands, after visiting the toilet
- not checking that the chicken was thoroughly cooked
- leaving the rice uncovered in the kitchen all day.

task 2c Design and make a rice salad

Draw up a chart to identify the potential risks, when making your rice salad. Design and make your salad using a combination of ingredients. Check against your chart, that your food handling is safe.





Information burst

Pathogens get into the kitchen on:

- raw foods
- dirt and food waste
- pests and pets
- people

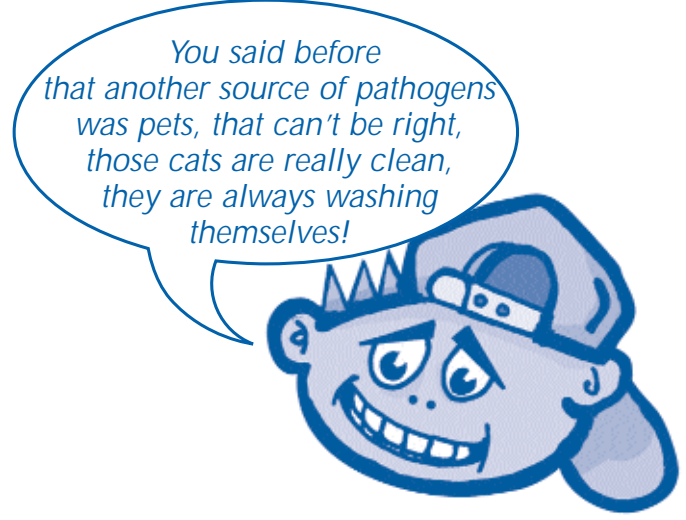
These are called the sources of pathogens.

The main source of pathogens in the kitchen is actually **raw food** itself, especially **raw poultry and meat**. Pathogens (e.g. Campylobacter and Salmonella) live in the guts of farm animals, which can then be transferred to the outside of raw meat during the slaughtering process. **Raw eggs** may contain **Salmonella** and **raw vegetables** may have a small number of pathogens on them from the soil.

Obviously you can't keep raw foods out of the kitchen but you can stop the raw foods from contaminating other foods and **control the pathogens by stopping them from multiplying**.

task 3a Demonstration identifying sources of contamination

A very important source of pathogens in the kitchen is you! The pathogen Staphylococcus aureus is carried by people in their **mouths, nose, on their hair and skin**. It can be spread to food by touching, sneezing or coughing on it. Even healthy people sometimes have pathogens in their **gut** that may be passed out in faeces and picked up on hands through toilet paper. These could include **Salmonella** and **Campylobacter**. This is why washing your hands after going to the toilet is so important.



Insects (e.g. flies) and **rodents** (e.g. mice) bring pathogens into the kitchen and are particularly good at spreading them around. If you think about where flies and other pests feed, it isn't surprising that you want to keep them away from your food.

Food waste may contain pathogens and attracts pests, which bring even more pathogens into the kitchen. This is why you must empty the kitchen bin regularly and always wash your hands after touching it.

task 3b Prepare a sandwich

Imagine that you are in charge of preparing sandwiches in a Youth Club. What precautions should you take to ensure that food is safe and free from contamination?

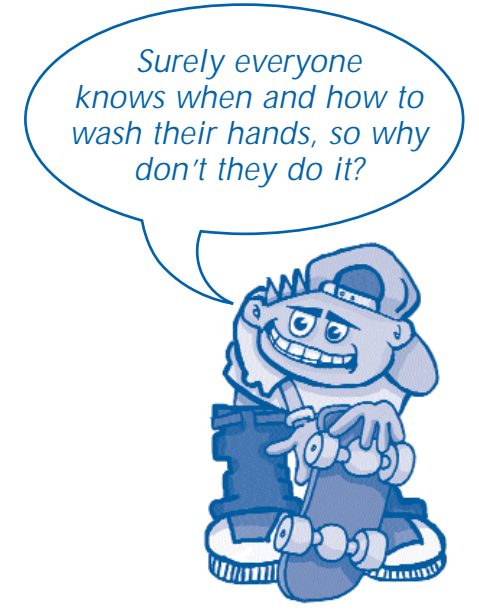
People bring pathogens into the kitchen on their skin and in their guts, they also move pathogens around by touching things. This is why **personal hygiene** in the kitchen is so important. Before preparing food it is important to thoroughly **wash your hands** with soap and dry them, not on a tea-towel! It's a good idea to **wear an apron** to stop your clothes from getting messy and to protect the food from any bacteria on your clothes.

Particular care should be taken if preparing foods when you are suffering from sickness and/or diarrhoea, because you may be carrying pathogens, which could spread to the food.

task 3c Non-pathogenic picnic

Design and make a 'safe food' product for a picnic. Consider what would make the food safe, how you would make it, and explain how you would store it.

Pets such as cats and dogs and even terrapins carry pathogens such as **Salmonella**. If you washed yourself like a cat you wouldn't get very clean! This is why it is very important to wash your hands after touching pets, particularly if you are going to handle food.





You know where pathogens come from, the first step in avoiding food poisoning is to try and stop pathogens from getting onto food (you are going to eat).

task 4a Pack the fridge

Explain where and how to store food safely.

Information burst

Pathogens are often found on raw food. **Cross-contamination** takes place when a source of pathogens (i.e. raw meat) **actually touches or drips** onto food you are going to eat and the pathogens transfer across. There is also another more sneaky type of cross-contamination where **no direct contact takes place**. Pathogens are **transferred not by other food, but by something else** such as contaminated hands, utensils, chopping boards etc.

Three examples of cross-contamination are:

- Raw burgers placed on a plate touching a pork pie. Pathogens on the raw burgers get transferred onto the cooked pork pie. This is why raw food should

always be stored separately from cooked foods and covered when stored.

- Raw steak placed directly on the top shelf of the fridge, above a home made cheesecake. The blood from the steak that may contain pathogens drips onto the cheesecake. This is why raw food in the fridge should always be stored below cooked food and all food covered.
- A chopping board and knife are used to slice some raw pork for a stir fry and put in a pan, the board looks clean but still has pathogens on it. **Without washing the board and knife**, they are used to cut up **salad vegetables**. So, the pathogens on the chopping board and knife are transferred to the **salad**.

task 4b Spot the mistake

Use the previous examples and fill in the table below. One example has been completed for you. Think of two more examples of cross-contamination, using one indirect source of cross-contamination. Describe your examples in the table below.

What was the mistake? 'The action'	What might happen? 'The hazard'	What should you do to prevent this? 'The control'
The raw burgers touched the cooked pork pie.	Pathogens (e.g. Campylobacter) from the raw burgers contaminate the pork pie.	Always store raw and cooked food separately and cover.



Cross-contamination is **very common**. In the last example you could contaminate the whole kitchen in no time and not even know it. **The rules that prevent cross-contamination are very simple and very, very important.**

- Before preparing food always wash your hands thoroughly.
- After preparing raw food (e.g. raw meat, poultry, eggs) always wash any plates, chopping boards, knives etc. and of course your hands, straight away.
- Keep other sources of pathogens (e.g. pets, flies, mice etc.) out of the kitchen.

Remember that for some types of pathogens, such as **Campylobacter** and **E.coli O157** only very few bacterial cells are required to cause food poisoning. For these types of pathogens it is even more important to prevent contamination from occurring.

task 4c Chicken-lickin' dish

Design and make a chicken dish for a meal. Explain how you will identify the potential hazards which may be encountered during the preparation, storage and serving of the dish.

My receptors are rumbling - they must have sensed some warm protein close by? Can I get my nutrient fix now?

Warm food, you say? May not be safe - we need to check out this temperature business.



Most pathogens need to be present in large numbers when the food is eaten to actually cause food poisoning. Following cross-contamination and given the right conditions, the number of bacterial cells will increase up to a level that will cause food poisoning.

task 5a Brainstorming

I hear humans like a warm sunny day. Are these pathogens the same?

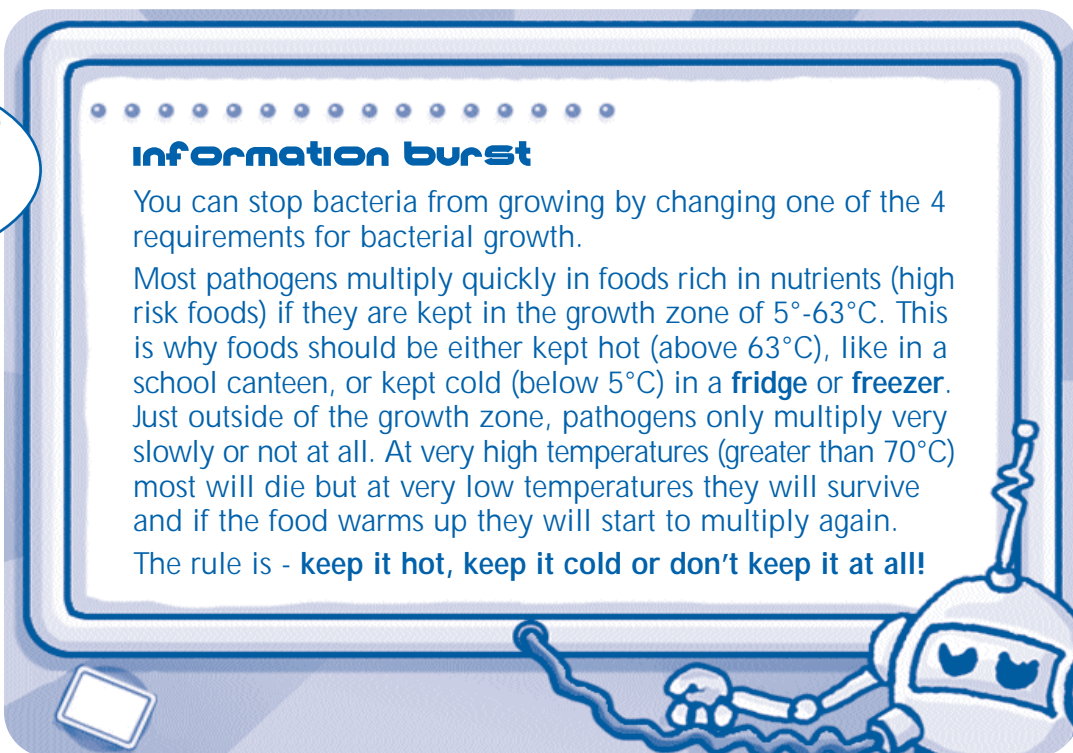


Information burst

You can stop bacteria from growing by changing one of the 4 requirements for bacterial growth.

Most pathogens multiply quickly in foods rich in nutrients (high risk foods) if they are kept in the growth zone of 5°-63°C. This is why foods should be either kept hot (above 63°C), like in a school canteen, or kept cold (below 5°C) in a fridge or freezer. Just outside of the growth zone, pathogens only multiply very slowly or not at all. At very high temperatures (greater than 70°C) most will die but at very low temperatures they will survive and if the food warms up they will start to multiply again.

The rule is - **keep it hot, keep it cold or don't keep it at all!**



task 5b Let's probe!

Record the temperature of a fridge over a set period of time, using temperature probes. Discuss the data collected and consider how the changes in temperature could affect the stored food over a period of time.

What about when humans take their shopping home? It's not refrigerated then!

On such occasions, if foods rich in nutrients (high risk foods) are not refrigerated, then temperatures can become high enough to allow bacteria to **multiply** rapidly. Try to keep the time that the food is in the growth zone to a minimum by putting chilled foods into the fridge as soon as you get home. A good way of keeping the food cool is to use a cool bag.



Labels on perishable (high risk) foods carry a 'use by' date telling you when the food should be eaten by and also telling you how to store the food e.g. keep refrigerated. Perishable foods include poultry, fish, meat, milk and prepared (cook - chill) meals. Food should not be eaten after the 'use by' date because the growth of micro-organisms will have caused it to go off and it may also be unsafe to eat.

Foods, which have a longer shelf life such as bread or breakfast cereals, are labelled with a 'best before' date. This tells you when the food should be eaten by in order for it to be at its best. If eaten after the 'best before' date it is unlikely to cause illness, but the food may not be in peak condition e.g. biscuits may have gone stale.

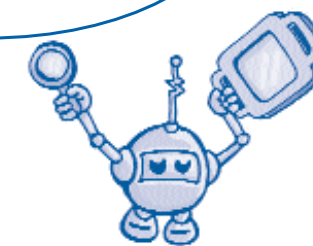
task 5c Label comparison and design

Analyse food labels from 5 different products. Discuss in groups. Prepare the dish you have chosen, and design a label which lists the ingredients and instructions for cooking, as well as safe storage instructions. Include a 'use by' date.

But what does it matter? We're going to cook it - I've heard that cooking kills pathogens anyway!



Cooking food thoroughly will help make it safe but some pathogens have a couple of other tricks up their sleeves you have to be careful of.



Remember toxins? If the food has not been stored properly and pathogens have produced toxins, **even thorough cooking may not make the food safe**. This is because some toxins can survive cooking and why it is important to make sure that foods rich in nutrients (high-risk foods) are kept out of the growth zone, even if they will eventually be cooked.

Preserving food
Other ways to stop bacteria and other micro-organisms from growing include:
Drying removes the water that all bacteria need to **multiply**. When the water is put back bacteria will start to **multiply** again.
Vacuum packing removes the air and stops micro-organisms that need air for multiplying.
Preservatives prevent micro-organisms from **multiplying** by being toxic to them.

Remember spores? Even if the food has been thoroughly cooked this will not kill spores **because they are very heat resistant**. Spores themselves will not cause food poisoning and thoroughly cooked food, served hot will be safe to eat. **However, if the food is kept warm in the growth zone then the spores will begin multiplying and pathogens could reach high numbers.**



The final opportunity to prevent food poisoning is to kill any pathogens that may have escaped and have contaminated the food.

When cooling foods rich in nutrients (high-risk foods) you must be very careful to ensure that no pathogens multiply in the food as it passes through the growth zone. The key is to **cool the food quickly**. For example, meat should be sliced and laid out thinly; liquids such as soup can be cooled quickly by pouring into a shallow container and placing on ice. After no more than 90 minutes, cover the food and put it in the fridge.

Foods rich in nutrients (high risk foods) that have been cooled and kept in the fridge can be safely reheated, but must be **reheated thoroughly** and not just warmed through. **Microwaves** are a very convenient way of reheating food. When reheating **prepared foods**, follow the instructions **on the label**. Avoid reheating food more than once as each time the food passes through the growth zone any pathogens will start to **multiply**.

Remember: keep it hot, keep it cool or don't keep it at all!

task 6a Brainstorm: Preventing growth

Brainstorm the steps in preventing food poisoning.

Information burst

Pathogens can be killed by cooking foods to a temperature of **at least 70°C for at least 2 minutes**. The hotter the food becomes, the quicker the pathogens will die. But the **spores** and **possibly the toxins** will not be destroyed.

It's important to always follow any cooking instructions on the label, but the best way of checking that food is thoroughly cooked is to use a **meat thermometer**. Check that the centre of the food reaches at least 70°C for at least 2 minutes. If you don't have a thermometer, ensure the food is piping hot. Food such as poultry, burgers, sausages etc will be thoroughly cooked **when the juices are clear**.

task 6c Using heat and chemical reactions used to kill

Pickling, freezing, making jam and chutney are all ways of removing one or more of the conditions necessary for bacterial growth. Choose one method of preservation to explore and illustrate its use in your next practical task. E.g. lemon curd or pickled eggs.

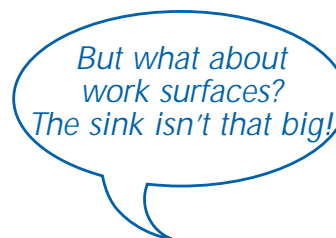
Information burst

You also need to kill or **remove** pathogens when **washing up or cleaning**. Pathogens on chopping boards, knives and other utensils can be killed by piping hot water (if you are not using rubber gloves then the water isn't hot enough!). The washing-up liquid breaks up the greasy parts into small globules that can be washed away. Rinsing in very hot water removes detergent residue and allows the utensils to dry quickly in the air - removing the possibility of re-contaminating them with a dirty tea-towel.

Similarly, **kitchen cloths** can easily spread pathogens around. Think about the 4 requirements for bacterial multiplication; it's not unusual for a cloth or tea-towel to be **wet**, have **food** on it and be kept in a **warm** kitchen for a period of time. Pathogens could even be **multiplying** on the cloth! Kitchen cloths should be **bleached, disinfected or changed regularly**.

task 6b Cooking to kill

Investigate the most effective way to cook an egg in three minutes, so that the egg reaches a temperature of 70°C. Choose two of the following methods to compare: boiling, poaching, frying or scrambling. Use food probes and wipes to record temperatures of the centre of the cooked eggs.



Work surfaces must be kept clean and they should be **disinfected regularly**, especially when raw meat or poultry has been prepared.

So finally, you know how to stop food poisoning. Follow the steps:

- 1 Stop pathogens from contaminating the food
- 2 Stop pathogens from multiplying
- 3 Kill any pathogens

One last reminder - when you handle food, remember that you too have a part to play in preventing food poisoning.

Kitchen hero ... or hopeless at hygiene?

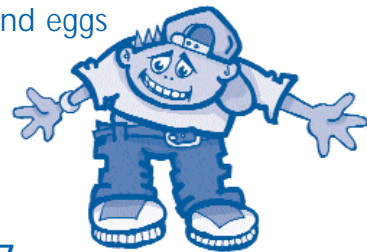
Are you happily hygienic or are your food habits not as good as they should be? Should your friends and family flee when you offer them a sandwich? Try the quiz to find out. Pick the correct answer.

1. Bacteria are ...

- a) easily seen in daylight
- b) only visible in water
- c) possible to see when they float in the air
- d) too small to see with the naked eye

2. Salmonella bacteria are found in ...

- a) raw chicken and eggs
- b) bread
- c) tomatoes
- d) spaghetti



3. Is E. coli O157

- a) a kind of bacteria responsible for food poisoning?
- b) a kind of bacteria that helps plants make their own food?
- c) a large virus?
- d) a new boy-band?

4. After shopping, you have to put a bag of raw minced meat away. You should put it ...

- a) at the back of the cupboard with the canned foods
- b) on the top shelf of the fridge, next to the pork pies and cheese
- c) on the lowest shelf of the fridge, making sure it is separated from any other foods
- d) on a plate on the worksurface, making sure the bag has not been opened

5. Bacteria multiply by dividing into two. In ideal conditions they can multiply

- a) every 10 seconds
- b) every 5 minutes
- c) every 20 minutes
- d) once an hour

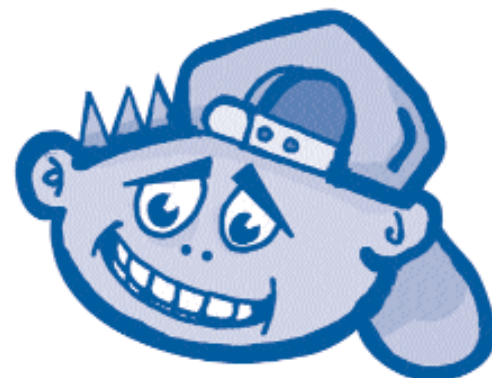


6. Your sister is about to make you a snack. She pushes the cat off the worksurface and opens the fridge. You ...

- a) shout at her and the cat
- b) wipe the worksurface with a duster to remove the cat's hairs
- c) remind your sister to clean the surface and her hands thoroughly before she does anything else
- d) sigh and make your own sandwich on the worksurface straightaway

7. It is the 7th April. Your yoghurt has a label saying "use by 5 April". You should ...

- a) eat it straightaway
- b) open it - if it looks alright, you'll eat it
- c) give it to your little brother
- d) chuck it out now



8. Pathogens like to grow in foods which are ...

- a) moist and rich in nutrients
- b) full of sugar e.g. jam and honey
- c) dry and salty
- d) preserved in vinegar

9. You've just been shopping and bought a Ready to Eat chicken dinner for tonight. You're going to the cinema first. You ...

- a) take the shopping with you to the cinema
- b) go straight home and put the chilled and frozen food away
- c) get home, dump the shopping on the table and leave for the cinema - you did the shopping after all!
- d) leave the shopping in a cool corner at your friend's place

10. You notice the fridge seems a bit warm. You check the temperature shown on the fridge thermometer because you know it should be ...

- a) below 0°C
- b) between 0° to 5°C
- c) between 8° to 10°C
- d) above 10°C

11. You're cooking supper tonight. You reheat last night's cottage pie in the oven. At the end of the cooking time you ...

- a) put it straight on the table and leave everyone to help themselves
- b) check that its piping hot right through and put it back in the oven if it isn't
- c) let your brother eat the leftovers when he gets in a few hours later
- d) give it to the dog

12. You're helping with the washing up. Your Mum / Dad asks you to dry up. You ...

- a) tell them its more hygienic to let things dry by themselves
- b) use the damp tea-towel that's been used all day
- c) pick the tea-towel out of the dog basket and begin
- d) leave the house by the back door

13. At the supermarket checkout, the cashier puts your packet of raw chicken in the same carrier bag as your salami. You ...

- a) don't care
- b) take the raw chicken out and put it in the bag with the yoghurts
- c) repack them in separate bags
- d) put the dog food in the carrier bag too

